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(54) **ROTATION-RATE DETECTOR FOR SPINNING TOP**

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(58) **Field of Classification Search**
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     See application file for complete search history.

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(57)   **ABSTRACT**

A rotation-rate detector detects a rotation rate of a spinning top and is fixed to or detachably attached to a launcher. The launcher applies a rotational force to the spinning top to launch the spinning top. The rotation-rate detector includes a detachment detector that detects detachment and attachment of the spinning top. The rotation rate of the spinning top is detected after the detachment detector detects attachment of the spinning top.

6 Claims, 5 Drawing Sheets
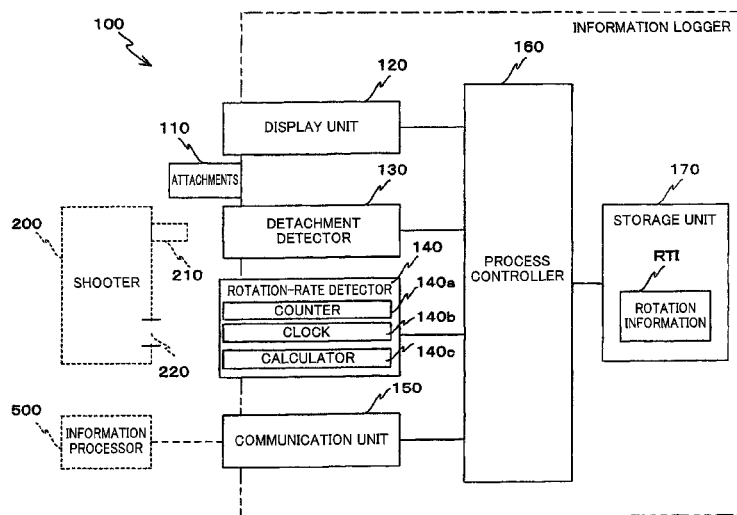
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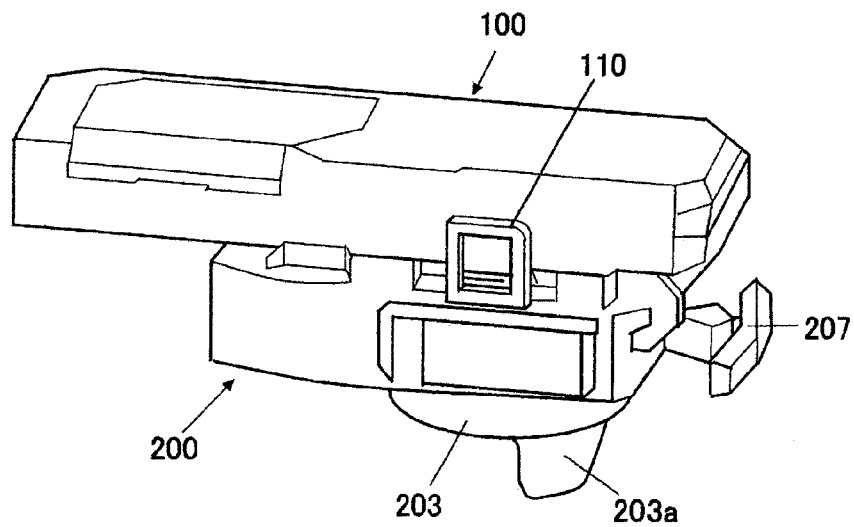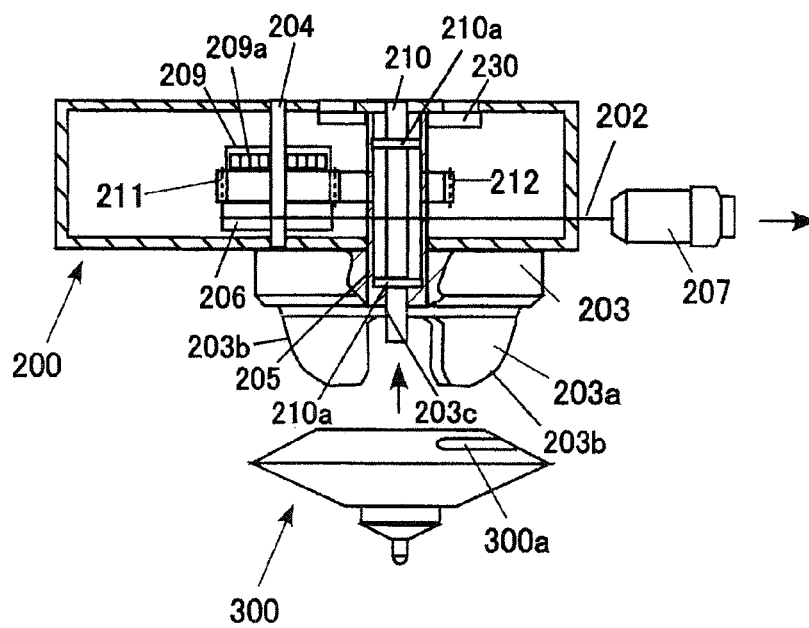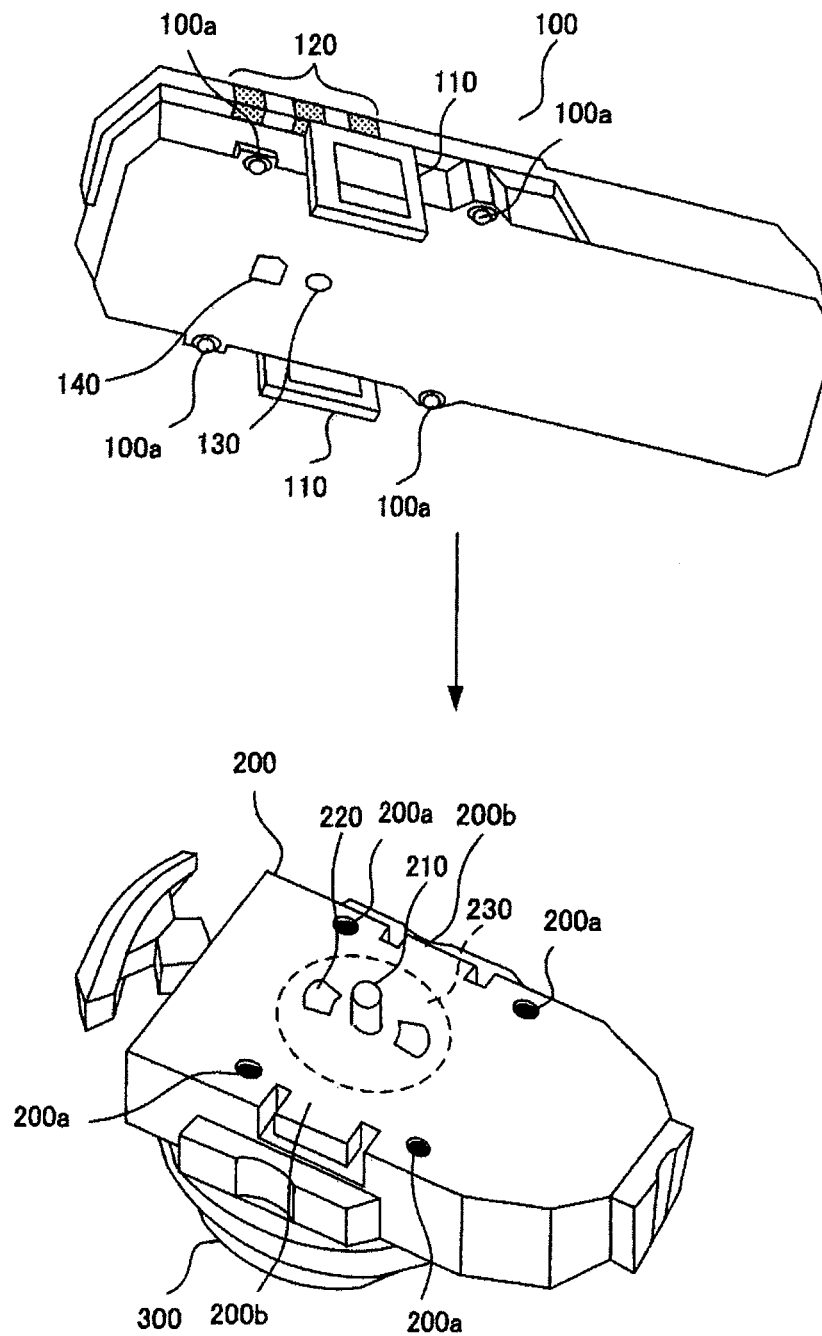
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FIG.1

FIG.2

FIG.3
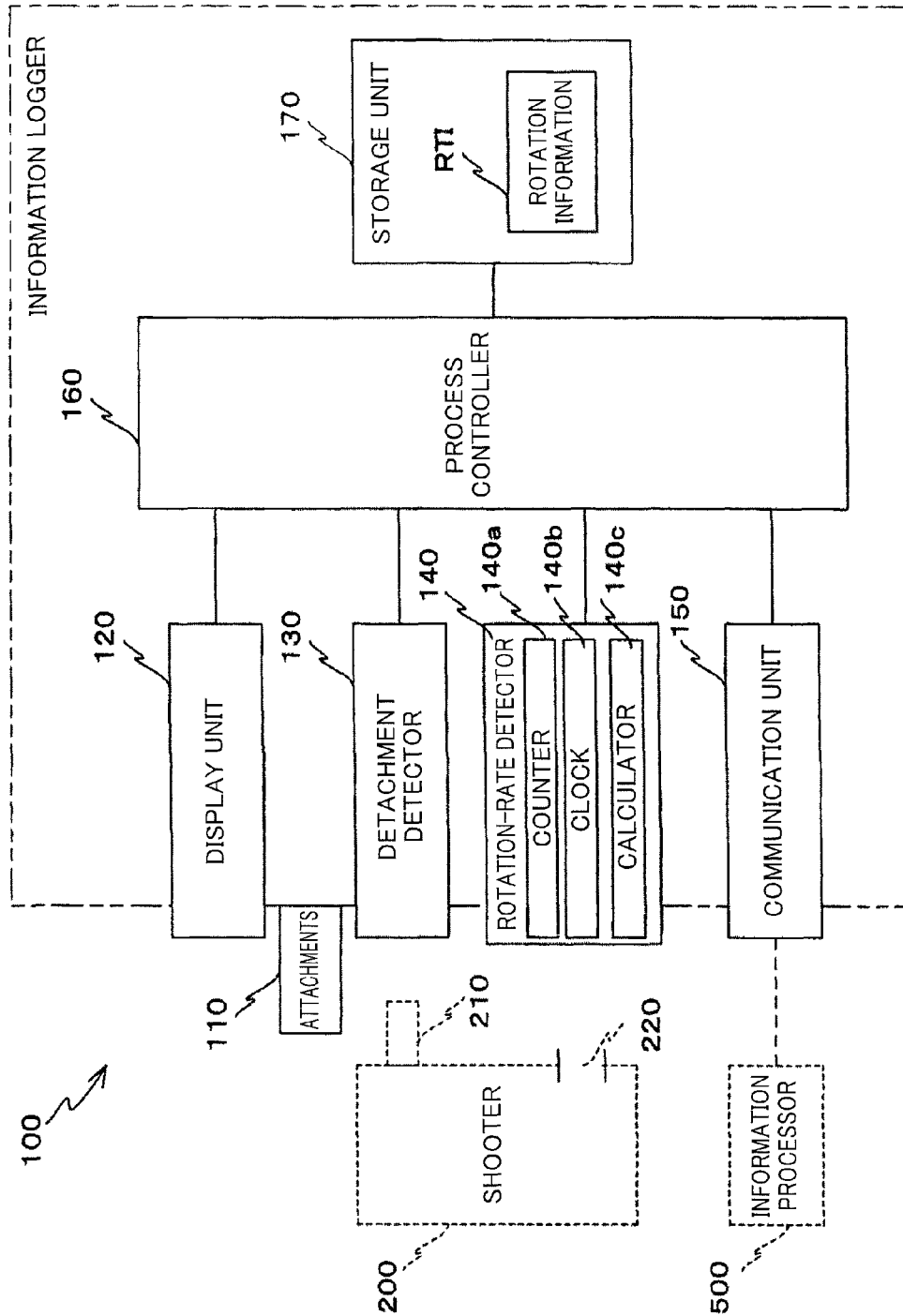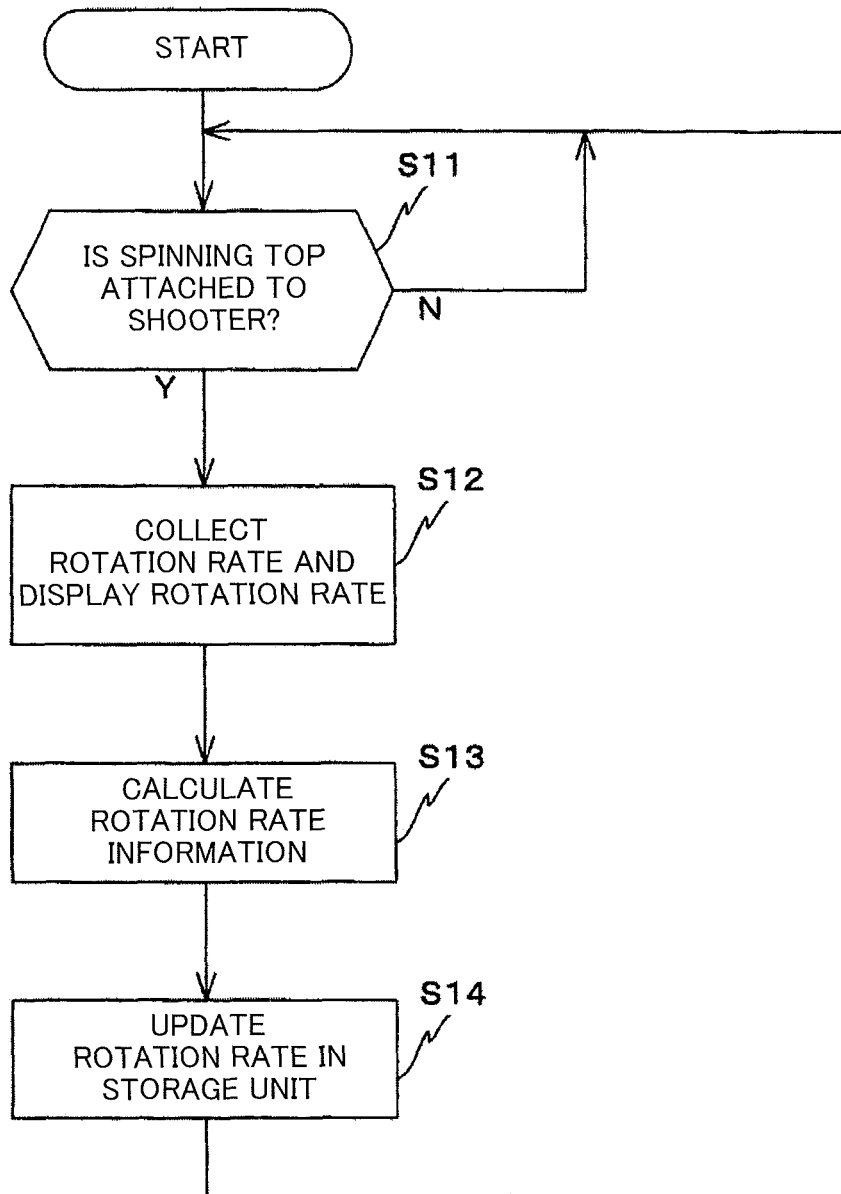
FIG.4

FIG.5

IDENTIFICATION INFORMATION (ID) OF USER
NICKNAME (NK) OF USER
NUMBER OF SHOTS (ST)
ACCUMULATED ROTATION RATE (AR)
HIGHEST ROTATION RATE (MR1)
SECOND HIGHEST ROTATION RATE (MR2)
THIRD HIGHEST ROTATION RATE (MR3)
AVERAGE ROTATION RATE (PAV)
AVERAGE ROTATION RATE OF ALL USERS (WAV)
HIGHEST ROTATION RATE OF ALL USERS (WMX)

FIG.6

```
              ┌─────────────────┐
              │      START       │
              └─────────────────┘
                        │
                        ▼
                                        S11
              ╱─────────────────╲
             ╱  IS SPINNING TOP   ╲
            ╱     ATTACHED TO      ╲ ──── N
            ╲      SHOOTER?        ╱
             ╲───────────────────╱
                        │ Y
                        ▼
                                        S12
              ┌─────────────────┐
              │     COLLECT      │
              │ ROTATION RATE AND│
              │DISPLAY ROTATION RATE│
              └─────────────────┘
                        │
                        ▼
                                        S13
              ┌─────────────────┐
              │    CALCULATE     │
              │  ROTATION RATE   │
              │   INFORMATION    │
              └─────────────────┘
                        │
                        ▼
                                        S14
              ┌─────────────────┐
              │     UPDATE       │
              │ ROTATION RATE IN │
              │  STORAGE UNIT    │
              └─────────────────┘
```

ROTATION-RATE DETECTOR FOR SPINNING TOP

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the foreign priority benefit of Japanese Application No. 2015-072884, filed Mar. 31, 2015, the content of which is incorporated herein by reference, which serves as priority for PCT Application No. JP2015/061798, filed Apr. 17, 2015.

TECHNICAL FIELD

The present invention relates to a rotation-rate detector for a spinning top.

BACKGROUND ART

Spinning top toys include electronic spinning-top game devices that can determine win and loss on the basis of data on the spinning tops, such as the number of rotations (for example, refer to Patent Document 1).

The electronic spinning-top game device according to Patent Document 1 includes a body including a fly wheel, which can be spun by an external spinning tool, and detects the rotation of the fly wheel. A controller detects the number of rotations of the fly wheel on the basis of the result detected by the rotation detector, and determines the energy of the electronic spinning top from the determined number of rotations.

PRIOR ART DOCUMENT

Patent Document

Patent Document 1: Japanese Patent Application Laid-Open No. 2002-219269

The electronic spinning-top game device according to Patent Document 1 may erroneously calculate the number of rotations of the fly wheel rotationally driven by the spinning tool if the spinning top is not attached to the device.

SUMMARY OF INVENTION

An object of the present invention is to provide a rotation-rate detector for a spinning top with minimum erroneous detections.

The first means is a rotation-rate detector that detects a rotation rate of a spinning top and is fixed to or detachably attached to a launcher, the launcher applying a rotational force to the spinning top attached to the launcher to launch the spinning top, the rotation-rate detector comprising:

a detachment detector that detects detachment and attachment of the spinning top,

wherein the rotation rate of the spinning top is detected after the detachment detector detects attachment of the spinning top.

The second means is the rotation-rate detector of a spinning top according to the first means, further comprising:

a counter that counts a number of rotations of the spinning top from beginning of rotation of the spinning top to detection of detachment of the spinning top by the detachment detector;

a clock that measures a time from the beginning of rotation of the spinning top to the detection of detachment of the spinning top by the detachment detector; and

a rate calculator that calculates the rotation rate of the spinning top based on the number of rotations counted by the counter and the time measured by the clock.

The third means is the rotation-rate detector of a spinning top according to the first or the second means,

wherein the launcher comprises a rod aligned with a rotational center of the spinning top attached to the launcher and movable in a direction along an axis and urges the rod with a predetermined urging force in one direction along the axis,

wherein the detachment detector comprises a detection switch that detects movement of the rod in an other direction along the axis against the urging force, and

wherein one end of the rod is urged by the upper surface of the spinning top attached to the launcher such that the rod moves in the other direction and turns on the detection switch.

The fourth means is the rotation-rate detector of a spinning top according to the first or the second means,

wherein the launcher comprises:

a rod aligned with a rotational center of the spinning top attached to the launcher and movable along an axis; and

a spring that urges the rod with a predetermined urging force in one direction along the axis,

wherein the detachment detector comprises a detection switch that detects movement of the rod in an other direction along the axis against the urging force, and

wherein one end of the rod is urged by the upper surface of the spinning top attached to the launcher such that the rod moves in the other direction and turns on the detection switch.

The fifth means is the rotation-rate detector of a spinning top according to the first means,

wherein the launcher and the rotation-rate detector are separate pieces, and

wherein the rotation-rate detector is detachable from the launcher and comprises the detachment detector.

The sixth means is the rotation-rate detector of a spinning top according to the fifth means, being configured as an information logger.

According to the first means, the detachment detector prevents calculation of the rotation rate when the spinning top is not attached to the launcher. Thus, erroneous detection of the rotation rate can be prevented.

According to the second means, the time is measured from the start of the spinning of the spinning top to the detachment of the spinning top to calculate the rotation rate more precisely.

According to the third and fourth means, one end of the rod is urged by the upper surface of the attached spinning top and moves to operate the detection switch to certainly detect the attachment of the spinning top.

According to the fifth means, the launcher and the rotation-rate detector are provided separately. Thus, the rotation-rate detector can be attached to another launcher.

According to the sixth means, the rotation-rate detector is configured as an information logger to facilitate the control of rotation rate.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a perspective view of an information logger attached to a launcher according to the present invention.

FIG. 2 is a schematic cross-sectional view of the launcher.

FIG. **3** is an external view of the information logger and the launcher in a separated state.

FIG. **4** is a schematic block diagram illustrating the information logger in FIG. **1**.

FIG. **5** illustrates example rotation information stored in the storage unit illustrated in FIG. **2**.

FIG. **6** illustrates a logging process of rotation information carried out by a process controller illustrated in FIG. **2**.

DESCRIPTION OF EMBODIMENTS

Embodiments of a rotation-rate detector of a spinning top according to the present invention will now be described with reference to the accompanying drawings.

FIG. **1** is an external view of an information logger **100**, which is configured as a rotation-rate detector according to an embodiment, attached to a launcher (shooter) **200**. FIG. **2** is a schematic cross-sectional view of the launcher.

Configuration of Launcher 200

The launcher **200** will now be described.

Pulling of a string **202** of the launcher **200** spins a spinning-top holder **203**, and thereby applies a rotational force to a spinning top **300**, which is coupled with the spinning-top holder **203**.

With reference to FIG. **2**, the launcher **200** includes shafts **204** and **205** disposed in parallel. The shaft **204** is a fixed shaft and supports a drum **206** around which the string **202** is wound. One end of the string **202** is fixed to the drum **206**, and the other end of the string **202** is connected to a handle **207**. A spiral spring **209***a* is wound around the shaft **204**. One end of the spiral spring **209***a* is fixed to the shaft **204**, and the other end is fixed to a spiral-spring case **209**. The handle **207** is pulled against the urging force of the spiral spring **209***a* to spin the drum **206**. The shaft **204** supports a toothed wheel **211**. The toothed wheel **211** rotates together with the drum **206** as the handle **207** is pulled.

The shaft **205** is a rotary shaft and supports a toothed wheel **212**. The toothed wheel **212** engages with the toothed wheel **211**.

The shaft **205** is shaped as a cylinder and supports the spinning-top holder **203** at the bottom end of the shaft **205**. The spinning-top holder **203** has two hooks **203***a*, which are fit in engagement holes **300***a* of the spinning top **300** to support the spinning top **300**.

The pulling of the handle **207** spins the shaft **205** via the toothed wheels **211** and **212** and thereby spins the spinning-top holder **203**.

The upper end of the shaft **205** supports a rotary body **230**, which is described below.

The shaft **205** slidably accommodates a rod **210**, which serves as an ejector of the spinning top **300**. The rod **210** is unfixed and is pulled downward by a gravitational force. The rod **210** has a flange **210***a*. This prevents the rod **210** from falling out. The rod **210** extends downward through a hole **203***c* provided in the center of the spinning-top holder **203**.

The rod **210** may be urged downward by a spring wound around the rod **210**.

The hooks **203***a* of the spinning-top holder **203** of the launcher **200** having such a configuration is coupled with the spinning top **300**. The handle **207** is pulled against the urging force of the spiral spring **209***a* to spin the drum **206** via the string **202**, thereby spinning the toothed wheel **211**. The spinning of the toothed wheel **211** is transmitted to the toothed wheel **212** to spin the shaft **205**. This spins the spinning-top holder **203**, and thereby swiftly spins the

spinning top **300**. Stopping the pulling of the handle **207** in this state stops the spinning of the spinning-top holder **203**. The top **300** supported by the spinning-top holder **203** continues to spin by inertia and detaches from the spinning-top holder **203** along a tilting surface **203***b* of the hooks **203***a* of the spinning-top holder **203**. Releasing the hand of the user from the handle **207** (completely releasing the pulling force) returns the launcher **200** to the initial state by the urging force of the spiral spring **209***a*. A one-way clutch is preferably provided in the power transmitting mechanism so as to prevent the spinning of the spinning-top holder **203** while returning to the initial state.

Configuration of Information Logger 100

The information logger **100** will now be described.

With reference to FIG. **3**, the information logger **100** has four protrusions **100***a* for positioning and attachments **110** for attachment of the launcher **200**. The four protrusions **100***a* are fit into the four depressions **200***a* of the launcher **200** for positioning. The attachments **110** are manually fit together with protrusions **200***b* of the launcher **200** to attach the information logger **100** to the launcher **200**. The attachments **110** are manually detached from the launcher **200** to separate the information logger **100** and the launcher **200**.

With reference to FIG. **3**, the information logger **100** includes a display unit **120** on a side face. In this embodiment, the display unit **120** includes three LED (light emitting diode) lamps. The on/off patterns of the LED lamps indicate eight different levels of the rotational force (i.e., shooting force) applied to the spinning top **300**, as described below. Alternatively, any other display scheme may be applied. For example, the number of LEDs and the control patterns thereof may be appropriately varied.

With reference to FIG. **3**, a detachment detector **130** and a rotation-rate detecting unit **140** are disposed on the bottom surface of the information logger **100**. The rotation-rate detecting unit **140** includes a counter **140***a* that counts the number of rotations of the spinning top **300** from the start of spinning to detachment, a clock **140***b* that measures the time from the start of the spinning to the detachment of the spinning top **300**, and a calculator **140***c* that calculates the rotation rate from the counted number and the measured time. The rotation rate may be represented in any unit, for example, rpm. Alternative or in addition to the rotation rate, which is the number of rotations per time, the actual number of rotations may be counted. This applies to the descriptions below, as well.

The rod **210** urged downward is disposed on the upper surface of the launcher **200**, as described above. The rod **210** is pushed upward by the spinning top **300** when the spinning top **300** is attached to the launcher **200** and protrudes from the upper surface of the launcher **200**. The detachment detector **130** opposes the rod **210** when the information logger **100** is attached to the launcher **200**. The detachment detector **130** detects the urging by the rod **210** protruding from the upper surface of the launcher **200** attached to the spinning top **300** so as to detect the attachment of the spinning top **300** to the launcher **200**. The detachment detector **130** is, for example, a detecting switch that detects the urging of the rod **210**.

With reference to FIG. **3**, openings **220** are provided in the upper surface of the launcher **200**. When the spinning top **300** is attached to the launcher **200**, the upper surface of the rotary body **230** in the launcher **200** is visible from above through the openings **220**. The rotary body **230** spins together with the spinning top **300** rotationally driven by the

launcher **200**. In this embodiment, the upper surface of the rotary body **230** has multiple sectoral regions, which have an identical central angle and are alternatively colored in black and white along the circumferential direction. While a rotational force is applied to the spinning top **300** by the launcher **200**, the color of the upper surface of the rotary body **230** viewed from above through the openings **220** cyclically switches between black and white. The shape and the colors may be any other ones that cyclically switch between different reflectances or materials, for example.

The rotation-rate detecting unit **140** opposes the openings **220** when the information logger **100** is attached to the launcher **200**. The rotation-rate detector **140** detects the rotation rate of the spinning top **300** through detection of the cycle of the color switching of the upper surface regions of the rotary body **230** viewed through the openings **220**.

With reference to FIG. **4**, the information logger **100** includes the attachments **110**, the display unit **120**, the detachment detector **130**, and the rotation-rate detecting unit **140**, which are described above, and further include a communication unit **150**, a process controller **160**, and a storage unit **170**. The display unit **120**, the detachment detector **130**, the rotation-rate detecting unit **140**, the communication unit **150**, and the storage unit **170** are connected to the process controller **160**.

The display unit **120** receives an instruction for a display pattern from the process controller **160**. The display unit **120** appropriately turns on or off the three LED lamps in accordance with the instruction for the display pattern.

The detachment detector **130** detects the urging of the rod **210** of the launcher **200**, as described above. The results detected by the detachment detector **130** are sent to the process controller **160**. The results are then sent from process controller **160** to the rotation-rate detecting unit **140**, as required.

The rotation-rate detecting unit **140** detects the rotation rate of the spinning top **300** attached to the launcher **200**, as described above. The results detected by the rotation-rate detecting unit **140** are sent to the process controller **160**.

In this embodiment, the rotation-rate detecting unit **140** includes a light source that emits light toward the openings **220** of the attached launcher **200** and a light-intensity detector that detects the intensity of the incident light. The rotation-rate detecting unit **140** detects the cycle of the intensity variation in the incident light, which is emitted from the light source and reflected at the upper surface of the rotary body **230**, so as to detect the cycle of the color variation in the regions on upper-surface the rotary body **230** irradiated with the light emitted from the light source, which leads to the detection of the rotation rate of the spinning top **300**.

The communication unit **150** transmits data signals to and from an information processor **500**. In this embodiment, the information processor **500** is assumed to be a smart phone that includes an earphone/microphone terminal through which data communication can be established.

The communication unit **150** includes a cable having a terminal electrically connectable to the earphone/microphone terminal. The cable is stored inside the information logger **100** when communication is not established with the information processor **500**.

The communication unit **150** receives the data sent from the process controller **160** and generates a signal appropriate for communication of the transmitted data. The communication unit **150** sends the generated signal to the information processor **500**. Alternatively, the communication unit **150** receives the data sent from the information processor **500**

and generates a signal representing the received data and conforming to the data format for the process controller **160**. The communication unit **150** sends the generated signal to the process controller **160**.

The process controller **160** comprehensively controls the operation of the information logger **100** and carries out a process based on the rotation rate detected by the rotation-rate detecting unit **140**. In this embodiment, the process controller **160** includes a CPU (central processing unit) and other units and carries out various processes through execution of programs stored in the storage unit **170**.

The processes carried out by the process controller **160** will be described below.

The storage unit **170** includes a non-volatile storage device. The storage unit **170** stores various types of information required by the process controller **160**. Such information contains programs executed by the process controller **160** and rotation information RTI.

With reference to FIG. **5**, the rotation information RTI contains identification information (ID) of the user and a nickname (NK) of the user. The rotation information RTI also contains the number of shots (ST), the accumulated rotation rate (AR), the highest rotation rate (MR1), the second highest rotation rate (MR2), the third highest rotation rate (MR3), and the average rotation rate (PAV). The rotation information RTI also contains the average rotation rate of all users (WAV) and the highest rotation rate of all users (WMX).

The identification information of the user is assigned by a management server that manages other information loggers similar to the information logger **100** and is sent to the process controller **160** via the information processor **500**. The process controller **160** registers this identification information as the identification information (ID) of the user in the storage unit **170**.

The nickname of the user is input to the information processor **500** by the user. The information processor **500** sends the input nickname of the user to the information logger **100**. The process controller **160** receives the nickname of the user from the information processor **500** via the communication unit **150** and registers this nickname of the user as the nickname (NK) of the user to the storage unit **170**.

The process controller **160** recalculates the values of the number of shots, the accumulated rotation rate, the highest rotation rate, the second highest rotation rate, the third highest rotation rate, and the average rotation rate every time a rotational force is applied to the spinning top **300** (this operation is referred to as a shot) by the launcher **200**. The process controller **160** updates the number of shots (ST), the accumulated rotation rate (AR), the highest rotation rate (MR1), the second highest rotation rate (MR2), the third highest rotation rate (MR3), and the average rotation rate (PAV) in the storage unit **170** using the recalculated values.

The average rotation rate of all users and the highest rotation rate of all users are sent from the management server to the process controller **160** via the information processor **500**. The process controller **160** registers the average rotation rate of all users and the highest rotation rate of all users as the average rotation rate of all users (WAV) and the highest rotation rate of all users (WMX) in the storage unit **170**.

Operation

The operation of the information logger **100** having a configuration such as that described above will now be described with focus on the processes carried out by the process controller **160**. Current information is registered to

the rotation information RTI in the storage unit **170**. In an initial state, the information logger **100** is attached to the launcher **200**.

With reference to FIG. **6**, in Step S**11**, the process controller **160** in the initial state determines whether the spinning top **300** is attached to the launcher **200** on the basis of the result detected by the detachment detector **130**. If the determined result in Step S**11** is negative (N in Step S**11**), Step S**11** is repeated.

If the spinning top **300** is attached to the launcher **200** and thus the determined result in Step S**11** is positive (Y in Step S**11**), the process goes to Step S**12**. In Step S**12**, the process controller **160** collects the detected result by the rotation-rate detecting unit **140** and displays the rotation rate. The process controller **160** collects the detected rotation rate sent from the rotation-rate detecting unit **140** and generates an instruction for a display pattern corresponding to the collected rotation rate. The process controller **160** sends the generated instruction for the display pattern to the display unit **120**. As a result, the display unit **120** appropriately turns on or off the three LED lamps in accordance with the instruction for the display pattern. The user can determine the level of the rotation rate of the spinning top **300** by viewing the display unit **120**.

In Step S**12**, the collection of the result detected by the rotation-rate detecting unit **140** and the display of the rotation rate are continuously carried out until the detachment detector **130** detects the detachment of the spinning top **300** from the launcher **200** on the basis of the result detected by the detachment detector **130**. After the detachment of the spinning top **300** from the launcher **200** is detected, Step S**12** ends and the process goes to Step S**13**.

In Step S**13**, the process controller **160** calculates the updated values of the number of shots, the accumulated rotation rate, the highest rotation rate, the second highest rotation rate, the third highest rotation rate, and the average rotation rate based on the rotation rate collected in Step S**12** and the respective current values of the number of shots (ST), the accumulated rotation rate (AR), the highest rotation rate (MR**1**), the second highest rotation rate (MR**2**), the third highest rotation rate (MR**3**), and the average rotation rate (PAV) in the rotation information RTI in the storage unit **170**.

Specifically, the process controller **160** calculates (ST+1) as the updated number of shots. The process controller **160** calculates (AR+(newly collected rotation rate)) as the updated accumulated rotation rate.

The process controller **160** updates the highest rotation rate, the second highest rotation rate, and the third highest rotation rate in accordance with the newly collected rotation rate. If the newly collected rotation rate is smaller than or equal to the current third highest rotation rate (MR**3**), the highest rotation rate, the second highest rotation rate, and the third highest rotation rate are not updated.

The process controller **160** divides the updated accumulated rotation rate with the updated number of shots to obtain the updated average rotation rate.

After the number of shots, the accumulated rotation rate, the highest rotation rate, the second highest rotation rate, the third highest rotation rate, and the average rotation rate are recalculated as described above, the number of shots (ST), the accumulated rotation rate (AR), the highest rotation rate (MR**1**), the second highest rotation rate (MR**2**), the third highest rotation rate (MR**3**), and the average rotation rate (PAV) in the rotation information RTI in the storage unit **170** are updated with the respective recalculated values in Step S**14**.

After the updating in Step S**14**, the process returns to Step S**11**. Steps S**11** to S**14** are then repeated.

The rotation information RTI updated as described above is sent to the information processor **500** in response to a reading request from the information processor **500**. The reading request is issued when a user inputs an instruction for reading to the information processor **500**.

Upon reception of the rotation information RTI from the information logger **100**, the information processor **500** displays the received content on the display unit of the information processor **500**. In this way, the user can determine the current rotation information RTI.

Upon reception of a request input by a user for transmission of the rotation information to a management server, the information processor **500** sends the identification information (ID) of the user, the nickname (NK) of the user, the number of shots (ST), the accumulated rotation rate (AR), the highest rotation rate (MR**1**), the second highest rotation rate (MR**2**), the third highest rotation rate (MR**3**), and the average rotation rate (PAV) received from the information logger **100** to the management server. The nickname (NK) of the user, the number of shots (ST), the accumulated rotation rate (AR), the highest rotation rate (MR**1**), the second highest rotation rate (MR**2**), the third highest rotation rate (MR**3**), and the average rotation rate (PAV) are linked to the identification information (ID) of the user and registered to the management server.

The management server updates the average rotation rate of all users and the highest rotation rate of all users in response to a new registration or an update of the registered content. The management server sends the updated average rotation rate of all users and the updated highest rotation rate of all users to the information logger **100** via the information processor **500**. This updates the average rotation rate of all users (WAV) and the highest rotation rate of all users (WMX) in the rotation information RTI in the storage unit **170**.

According to the embodiment described above, the rotation-rate detecting unit **140** detects the rotation rate of the spinning top **300** while a rotational force is applied to the spinning top attached to the launcher **200** with the attachments **110**. The rotation information of the spinning top **300** derived from the result detected by the rotation-rate detecting unit **140** is stored in the storage unit **170**. The rotation information RTI stored in the storage unit **170** is sent from the communication unit **150** as required.

According to this embodiment, the rotation information on the spinning top **300** acquired through the operation of the launcher **200** is recorded while the user actually senses the spinning of the spinning top **300** resulting from the operation of the launcher **200**, and the recorded information can be retrieved as necessary.

According to this embodiment, the detachment detector **130** detects that the spinning top **300** is attached to the launcher **200**. Thus, the detection by the rotation-rate detecting unit **140** can be started after the spinning top **300** is attached to the launcher **200** so as to effectively prevent erroneous detection by the rotation-rate detecting unit **140**.

According to this embodiment, the identification information (ID) of the user is stored in the storage unit **170** and is also included in the information sent from the communication unit **150**. Thus, the rotation information is linked to the individual user and stored in the storage unit **170**. Even if the launcher **200** is replaced with another one, the rotation information can be linked to the individual user and stored in the storage unit **170**. When the rotation information is sent from the communication unit **150**, the identification infor-

mation (ID) of the user is sent together. Thus, even if the user uses different launchers to apply rotational forces to the spinning top, the rotation information items acquired through the application of the rotational forces can be integrated and output as information associated with the individual user.

According to this embodiment, the display unit **120** displays the level of the intensity of the shooting force derived from the rotation rate of the spinning top **300** detected by the rotation-rate detecting unit **140**. Thus, every time the user uses the launcher **200** to apply a rotational force to the spinning top **300**, the user can confirm the level of the rotational force applied to the spinning top.

Modifications of Embodiment

The present invention should not be limited to the embodiment described above and may be modified in various ways without departing from the scope of the invention.

For example, the detachment detector may be a power switch of the information logger.

The rotation information may contain, for example, the number of shots, points assigned by the management server in accordance with the achieved rotation rate, and passwords for preventing improper update of the rotation information via unauthorized communication.

In place of or in addition to communication via an earphone according to the embodiment described above, the communication unit may establish communication via another scheme, such as an infrared communication scheme.

The communication partner via the communication unit may include another information logger so as to exchange identification information on friends.

The detachment detector should not be limited to a detection switch for detection of the movement of the rod **210** and may alternatively be a detector that optically or electromagnetically detects the detachment or attachment of the spinning top **300**.

The present invention can be suitably applied to the manufacturing of rotation-rate detectors for spinning tops.

The invention claimed is:

1. A rotation-rate detector that detects a rotation rate of a spinning top and is fixed to or detachably attached to a launcher, the launcher applying a rotational force to the spinning top attached to the launcher to launch the spinning top, the rotation-rate detector comprising:

a detachment detector that detects detachment and attachment of the spinning top,

wherein the rotation rate of the spinning top is detected after the detachment detector detects attachment of the spinning top.

2. The rotation-rate detector of a spinning top according to claim **1**, further comprising:

a counter that counts a number of rotations of the spinning top from beginning of rotation of the spinning top to detection of detachment of the spinning top by the detachment detector;

a clock that measures a time from the beginning of rotation of the spinning top to the detection of detachment of the spinning top by the detachment detector; and

a rate calculator that calculates the rotation rate of the spinning top based on the number of rotations counted by the counter and the time measured by the clock.

3. The rotation-rate detector of a spinning top according to claim **1**,

wherein the launcher comprises a rod aligned with a rotational center of the spinning top attached to the launcher and movable in a direction along an axis and urges the rod with a predetermined urging force in one direction along the axis,

wherein the detachment detector comprises a detection switch that detects movement of the rod in an other direction along the axis against the urging force, and

wherein one end of the rod is urged by the upper surface of the spinning top attached to the launcher such that the rod moves in the other direction and turns on the detection switch.

4. The rotation-rate detector of a spinning top according to claim **1**,

wherein the launcher comprises:

a rod aligned with a rotational center of the spinning top attached to the launcher and movable along an axis; and

a spring that urges the rod with a predetermined urging force in one direction along the axis,

wherein the detachment detector comprises a detection switch that detects movement of the rod in an other direction along the axis against the urging force, and

wherein one end of the rod is urged by the upper surface of the spinning top attached to the launcher such that the rod moves in the other direction and turns on the detection switch.

5. The rotation-rate detector of a spinning top according to claim **1**,

wherein the launcher and the rotation-rate detector are separate pieces, and

wherein the rotation-rate detector is detachable from the launcher and comprises the detachment detector.

6. The rotation-rate detector of a spinning top according to claim **5**, being configured as an information logger.

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